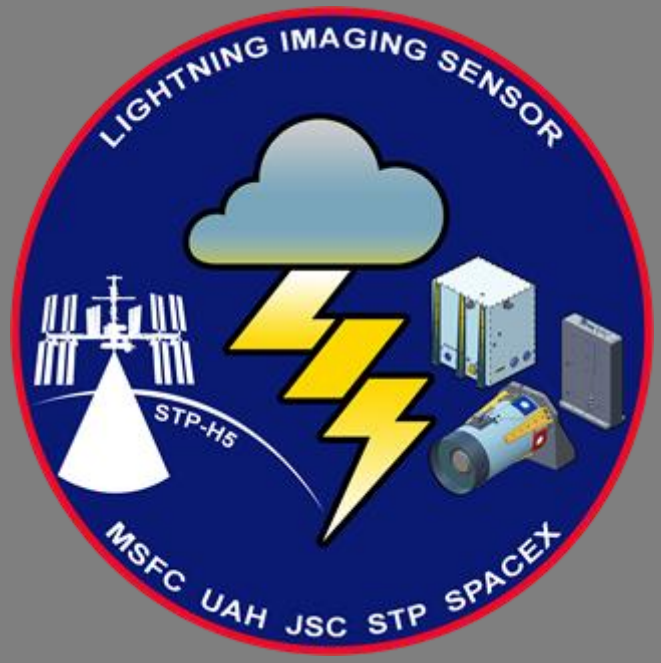
ISS LIS Status



2017 GHRC User Working Group Meeting
Sept 26-27, 2017

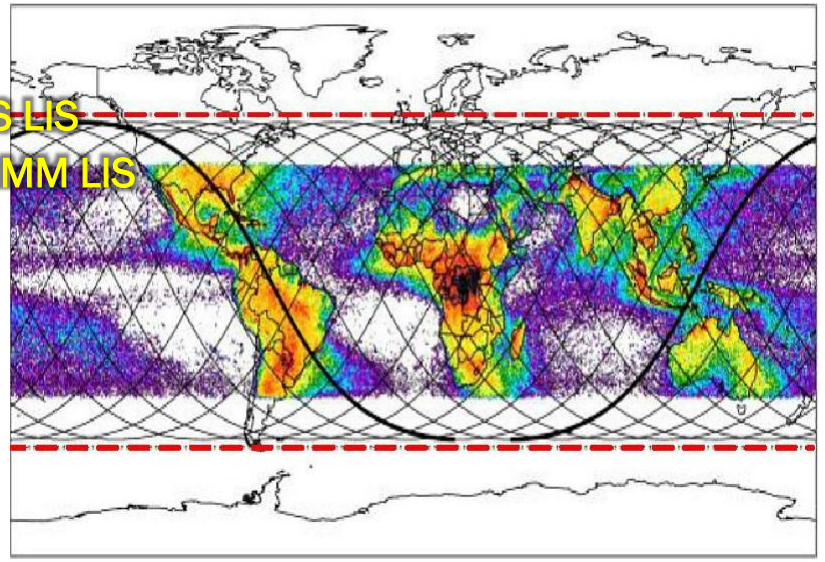
NASA

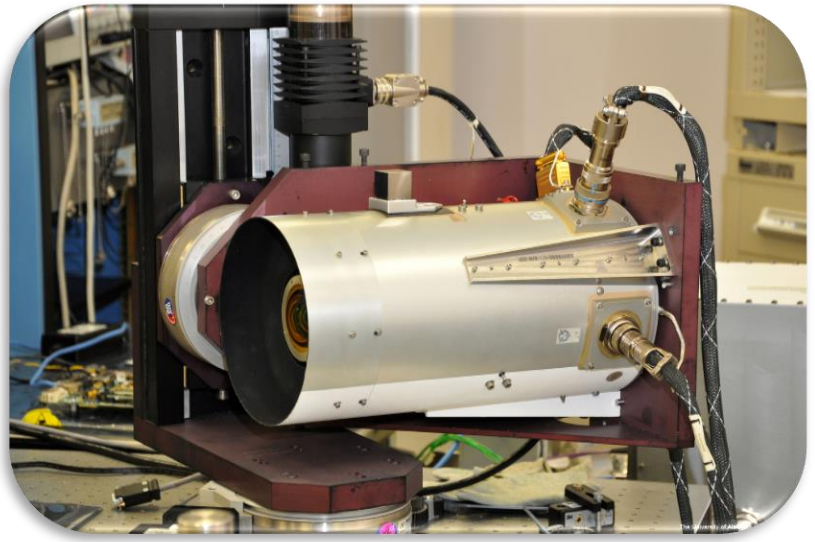
itsc
INFORMATION TECHNOLOGY AND SYSTEMS CENTER

THE UNIVERSITY OF ALABAMA IN HUNTSVILLE

Mission

- Fly a proven space-qualified, flight-spare LIS on the International Space Station (ISS) to take advantage of unique capabilities provided by the ISS
- Integrate LIS as a hosted payload on the DoD Space Test Program-Houston 5 (STP-H5) mission and launch on a Space X rocket for a minimum 2 year mission





LIS Heritage

- ISS LIS builds upon a solid foundation of 20 years on-orbit observations
- Key LIS scientists, engineers, and facilities are still in place to support this mission

Sensor Unit (legacy hardware)

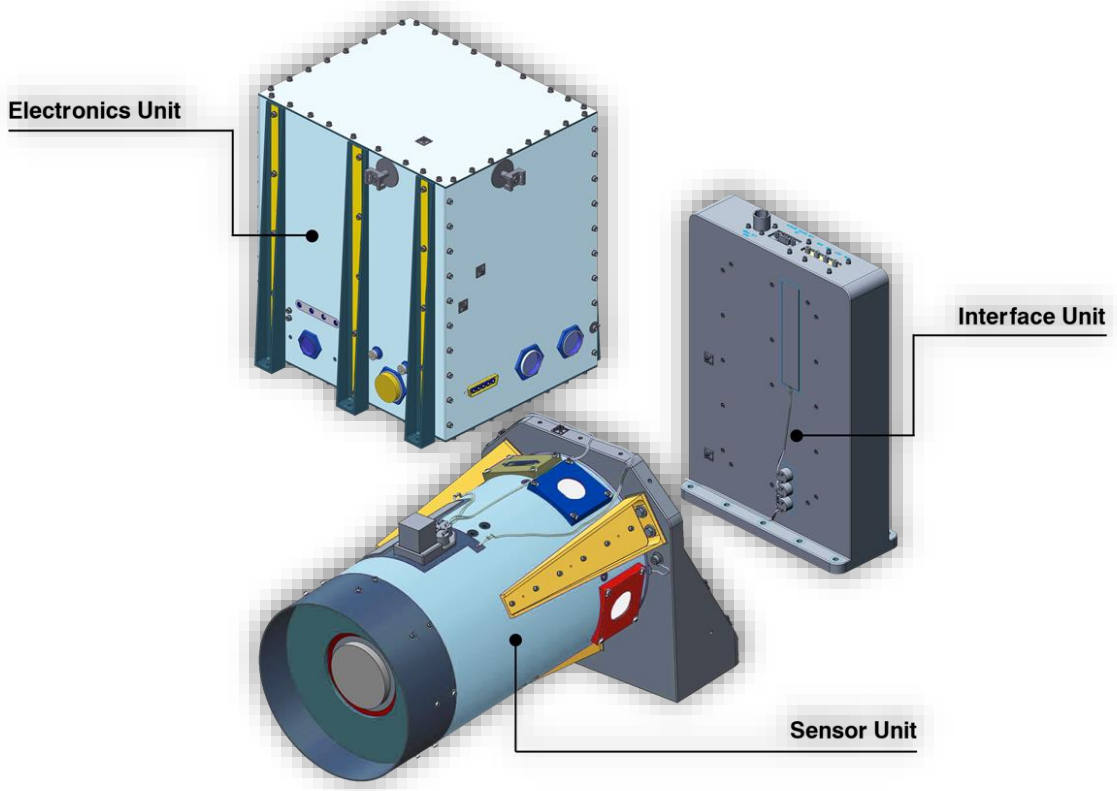
- Optical Assembly
- 128x128 CCD Focal Plane
- Lightning and Background detection

Electronics Unit (legacy hardware)

- Real Time Event Processor, Background removal, Data formatting
- Power conversion and control

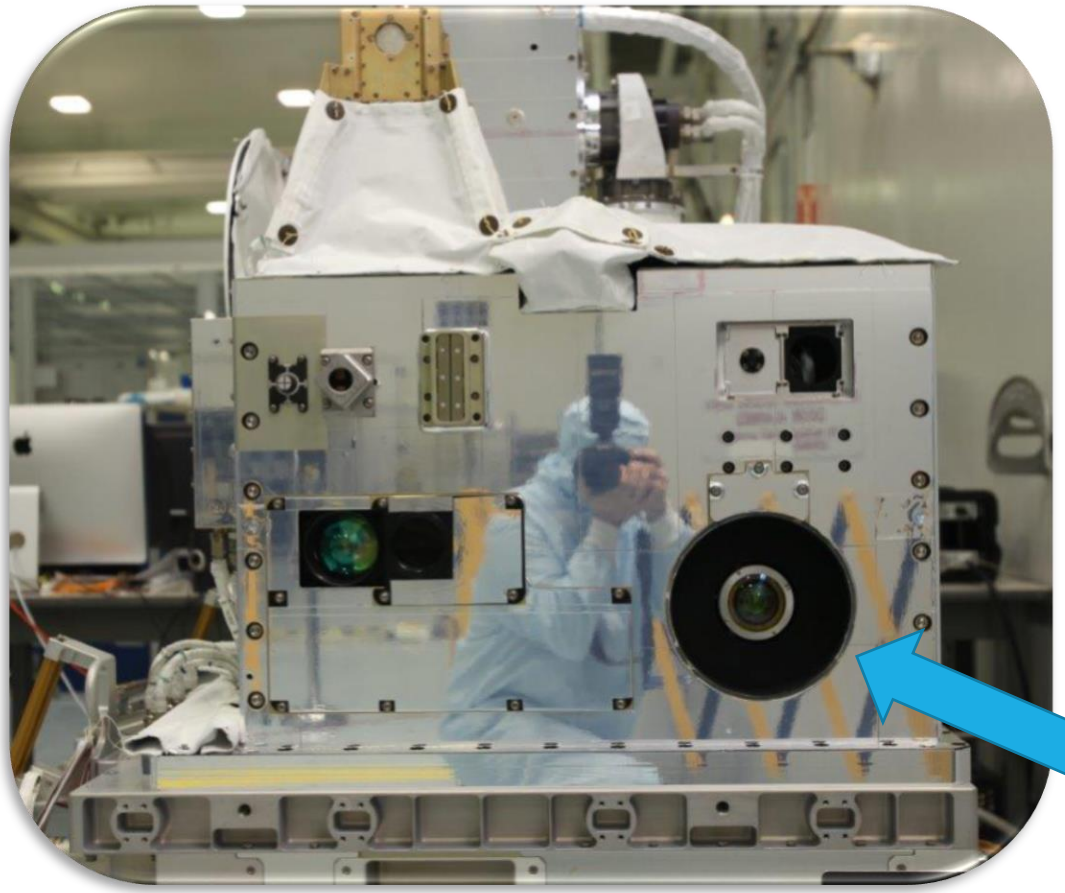
Interface Unit (new hardware)

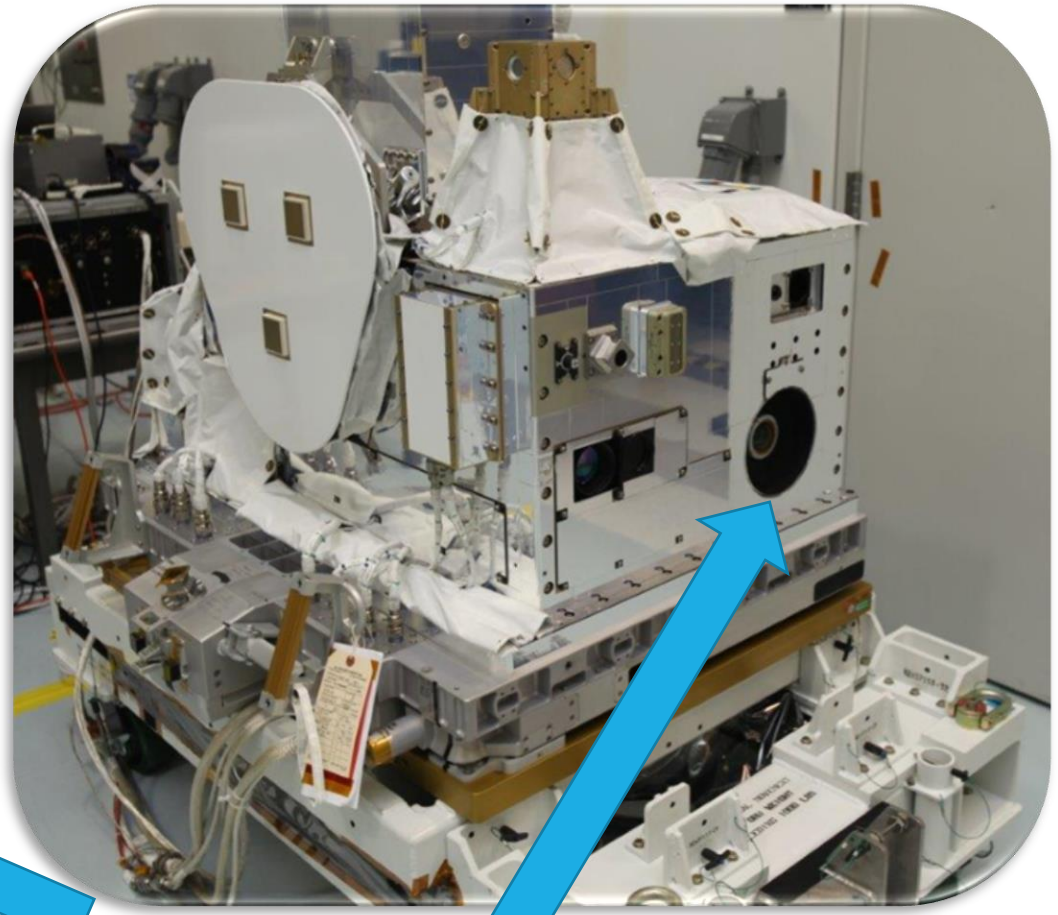
- Power conversion, Timing, Control
- ISS Interface



STP-H5 Integration

- LIS is one of thirteen instruments on the STP-H5 payload manifest





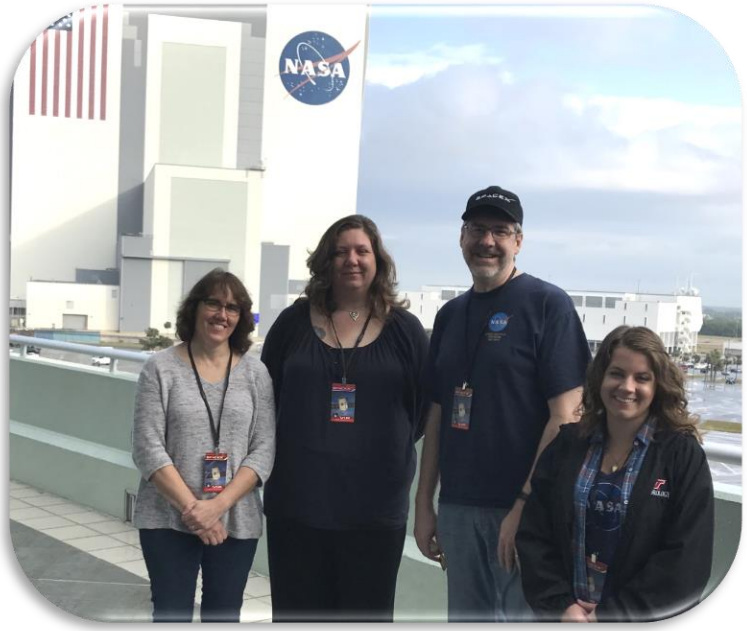
LIS Instrument

Launch

FEB 19 | Install | Activate | SAA | Auto Reset | Beta | LANCE

- Launch

- LIS Launched aboard Space X/CRS-10 on **February 19, 2017**



Installation

FEB 19 • Launch

FEB 27 • Install

Activate

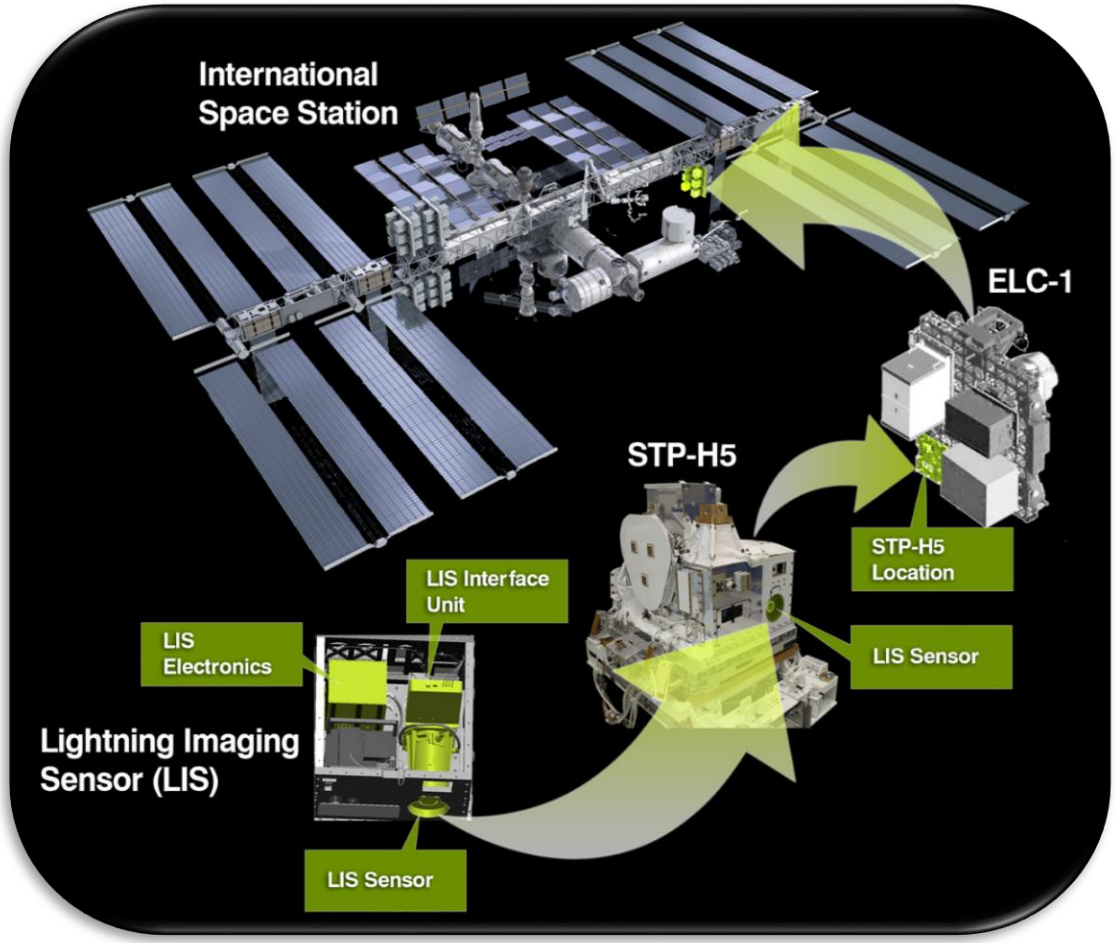
SAA

Auto Reset

Beta

LANCE

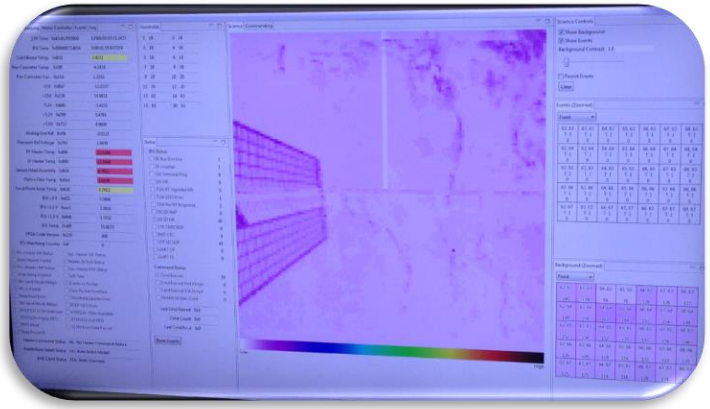
- STP-H5 platform robotically installed with LIS in an Earth viewing (nadir) position one week after launch



Instrument Checkout

FEB 19 • Launch
FEB 27 • Install
MAR 01 • Activate
SAA
Auto-Reset
Beta
LANCE

- GHRC & Lightning team supported install and checkout activities via the LIS Payload Operations & Control Center (POCC)
- ISS LIS science data began on **March 01, 2017**



First Light from LIS POCC GUI

Operational Issues

FEB 19 • Launch

FEB 27 • Install

MAR 01 • Activate

SAA

Auto Reset

Beta

LANCE

- Temperature
- South Atlantic Anomaly
- Automated Resets

Operational Issues: Temperature

FEB 19 • Launch → FEB 27 • Install → MAR 01 • Activate → SAA → Auto Reset → Beta → LANCE

- Pre-flight engineering revealed potential issue at certain ISS beta-angles
- If instrument exceeds max value, LIS must be powered down
- During first 6 months of operation LIS did not exceed max temp thresholds

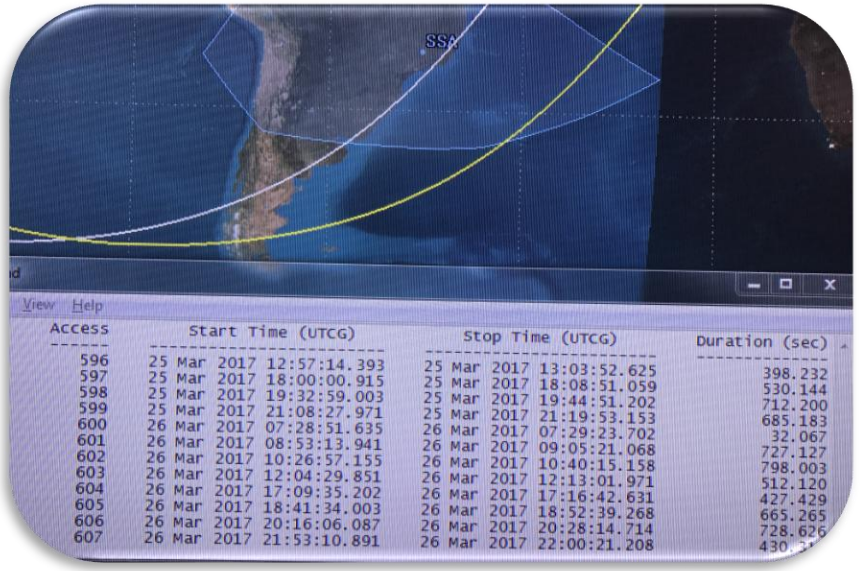
LIS EU/SU Housekeeping parameter	Red Limit High	Yellow Limit High	Yellow Limit Low	Red Limit Low	Reported Value
+15VDC EU	15.50	15.30	14.70	14.50	
-15VDC EU	-14.50	-14.80	-15.50	-16.00	
+5.2VDC EU	5.80	5.60	5.00	4.80	
-5.2VDC EU	-4.80	-5.00	-5.80	-6.00	
+5.0VDC EU	5.20	5.10	4.85	4.80	
AGR (Analog Ground Reference) EU	0.10	0.05	-0.05	-0.10	
PCIC (Power Converter Input Current) EU	3.00	2.50	0.60	0.54	
PRV (Precision Reference Voltage) EU	2.60	2.55	2.45	2.40	
Controller Board Temp EU	65.00	60.00	6.00	1.00	
Primary Filter Temp SU	45.00	40.00	21.00	20.00	
Seconday Filter Temp SU	45.00	40.00	21.00	20.00	
Power Converter Temp EU	55.00	50.00	-13.00	-18.00	
Optics Filter Temp SU	40.00	30.00	23.00	21.00	
Sensor Head Temp SU	55.00	50.00	10.00	5.00	
Focal Plane Array Temp SU	50.00	45.00	-2.00	-20.00	
IFU +5VDC	5.5	5.25	4.75	4.5	
IFU +3.3VDC	3.6	3.45	3.15	3	
IFU +1.5VDC	1.575	1.545	1.46	1.425	
IFU Temp	55	50	-45	-50	

Operational Issues: South Atlantic Anomaly

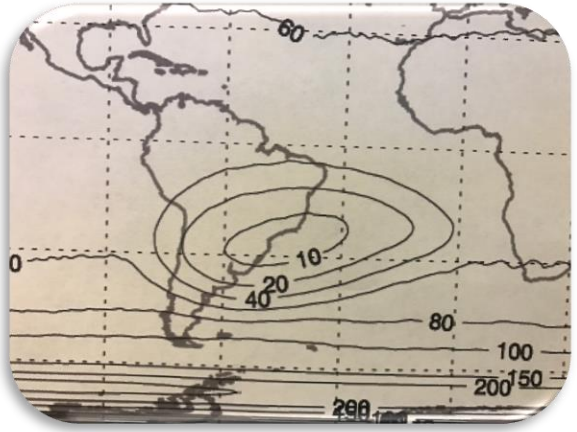
FEB 19 → FEB 27 → MAR 01 → MAR 2017 → Auto Reset → Beta → LANCE

- Launch
- Install
- Activate
- SAA

- South Atlantic Anomaly is known for high radiation events, and filters were added to prevent false events
- Team did not expect SAA events to cause instrument reset & lock-up issues
- During the first month of operation, the LIS instrument encountered almost daily reset events as well as several lock-up events



Tracking ISS passes through SAA



Operational Issues: Automatic Resets

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	Beta	LANCE
• Launch	• Install	• Activate	• SAA	• Auto Reset		

- Working with the Payload Operations and Integration Center (POIC), an automation script was developed
- Payload controllers (in POIC) have now receive alerts on LIS lock-up events and reset the instrument
- Science loss has gone from multiple-hours per incident to a few minutes

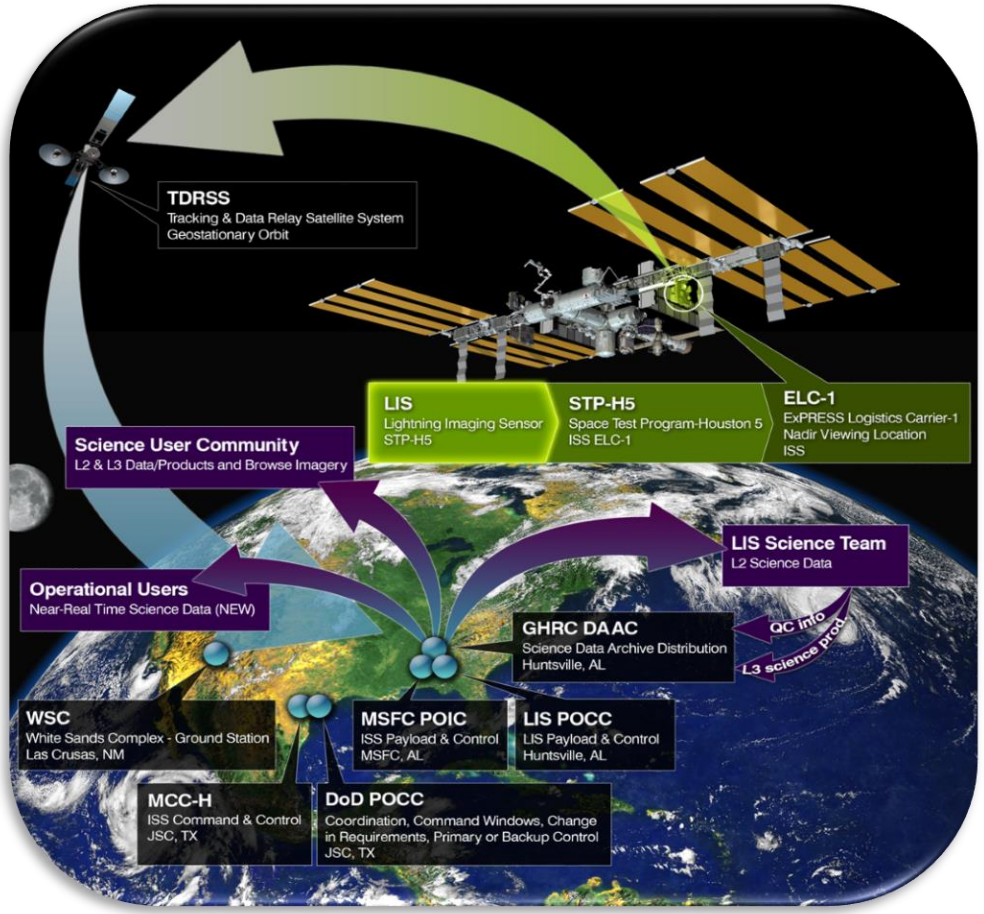
Lock-up events from first 30 days

ISS LIS Data Release

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	SEP 2017	LANCE
• Launch	• Install	• Activate	• SAA	• Auto Reset	• Beta	

- GHRC distributes the following ISS LIS datasets:
  - **NRT**: Near Real-Time
  - **NQC**: Non-Quality Controlled
  - **FINAL**: Final Quality Controlled

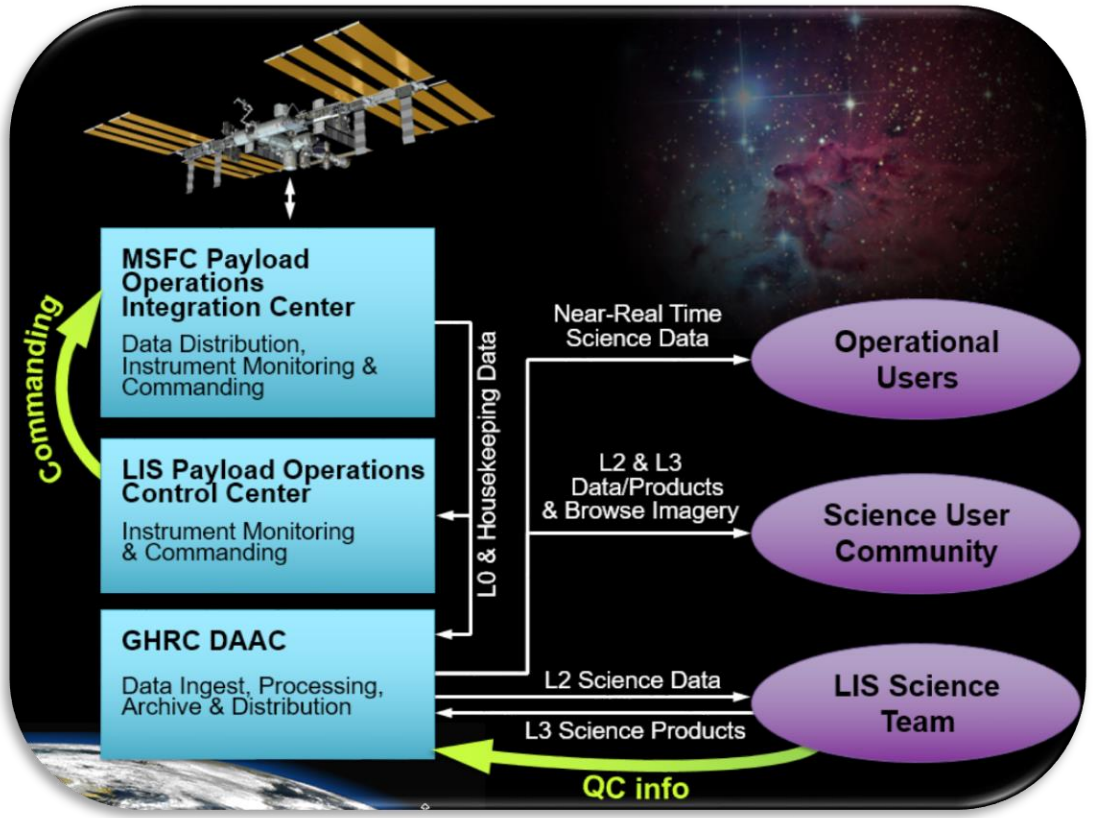
- **Beta ISS LIS data now available**



ISS LIS Data Distribution

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	SEP 2017	LANCE
• Launch	• Install	• Activate	• SAA	• Auto Reset	• Beta	

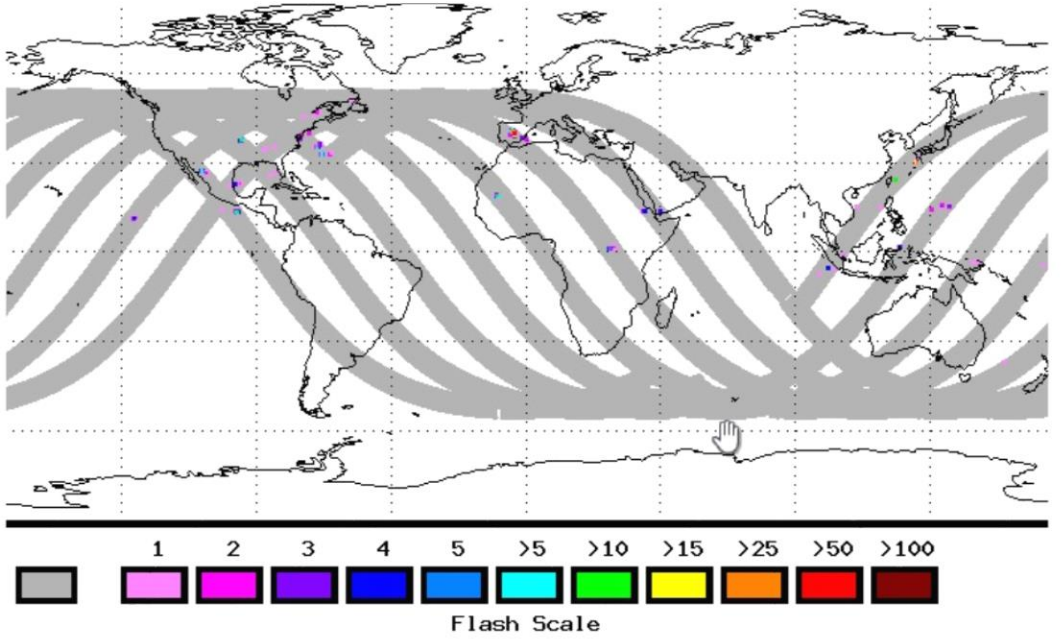
- LIS data distributed by GHRC DAAC:
  - HyDRO
    - https://ghrc.nsstc.nasa.gov/hydro/
  - Earthdata Search
    - https://search.earthdata.nasa.gov/
  - Lightning website
    - https://lightning.nsstc.nasa.gov/data/
  - Push Subscriptions
    - (coming soon)



LIS Data: NRT

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	SEP 2017	LANCE
• Launch	• Install	• Activate	• SAA	• Auto Reset	• Beta	

- NRT:
  - Near-real time data are available within two minutes of observation
  - Data contains holes
  - Data appropriate for applications requiring low latency



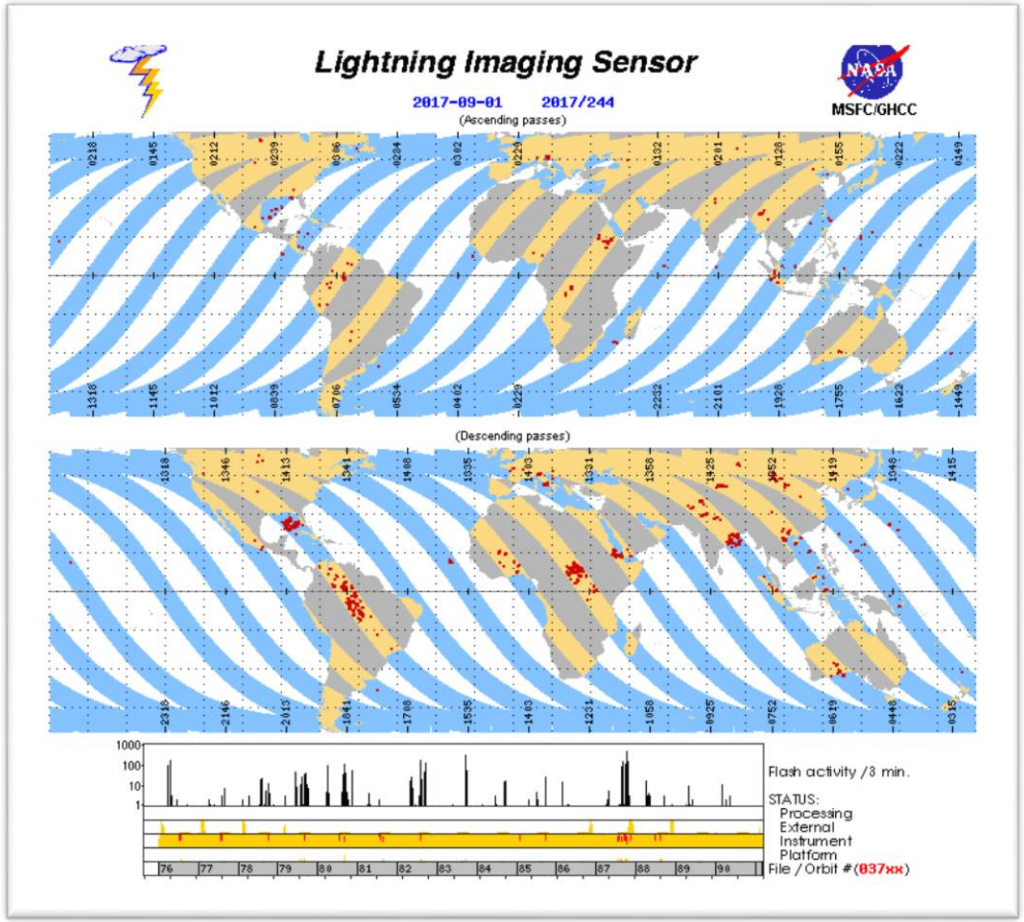
NRT: 12 Hour Browse Image

https://lightning.nsstc.nasa.gov/isslisib/isslisnrt.html

LIS Data: Standard Products

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	SEP 2017	LANCE
• Launch	• Install	• Activate	• SAA	• Auto Reset	• Beta	

- NQC:
  - Standard products are created daily
  - More completed than the near-real time data
  - Data has not been reviewed to assure data quality.
- Final:
  - Quality control steps preformed to ensure that all bad data are flagged
  - Data appropriate for scientific research and publications



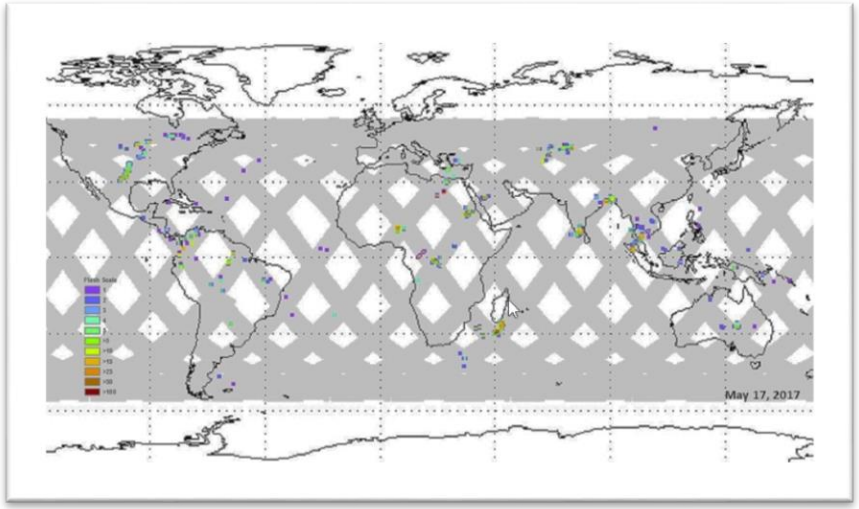
https://lightning.nsstc.nasa.gov/isslisib/isslisbrowsecal.pl

LIS Future: LANCE

FEB 19	FEB 27	MAR 01	MAR 2017	JUL 2017	SEP 2017	Q4 2017
• Launch	• Install	• Activate	• SAA	• Auto Reset	• Beta	• LANCE

Land, Atmosphere Near real-time Capability for EOS (LANCE)

- Enable users to get a snapshot of the Earth in near real-time
- Rapidly assess Hazards and Disasters
- Data and imagery available much quicker (< 3 hours) than routine processing allows



Create Full Resolution Imagery

- Global Imagery Browse Services (GIBS)
- Visualize the data by category in Worldview

https://worldview.earthdata.nasa.gov/